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E2F FAE FAG F110 F116  
U1S S1820 S1857

(56) Documents cited  
GB 2162891 A GB 2162890 A GB 2159575 A  
GB 2159574 A GB 1535453 A US 4685735 A

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UK CL (Edition L) E2F FAE FAG  
INT CL<sup>5</sup> B60N, E05D

## (54) Seat reclining mechanism

(57) A seat reclining mechanism including first and second members 51, 52 pivotally connected to one another and a gear transmission 55 drivingly connected to the first and second members 51, 52, the gear transmission 55 including an input shaft which, on rotation in one direction, causes the first and second members 51, 52 to move angularly apart in a reclining direction and biasing means 60 operably connected to the first and second members to provide a biasing force opposing movement of the first and second members in the reclining direction. The biasing means 60 may be in the form of a torsion spring 61 connected between first and second members 51, 52 or it may be connected between a seat back and a seat cushion to which the first and second members 51, 52 are mounted.

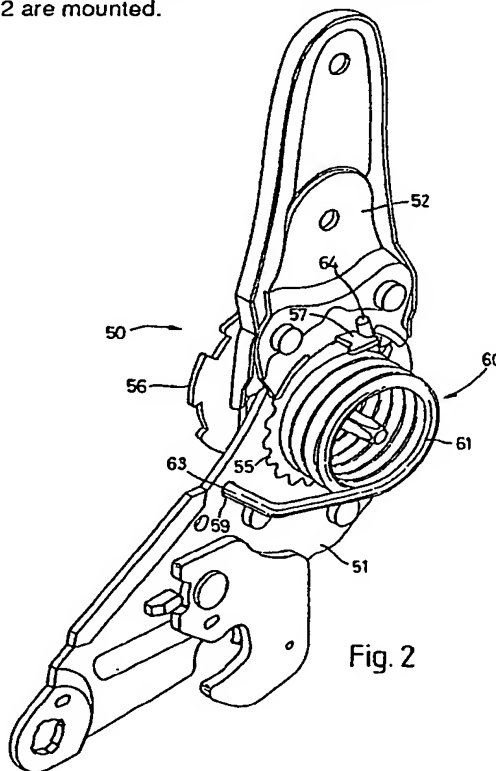


Fig. 2

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

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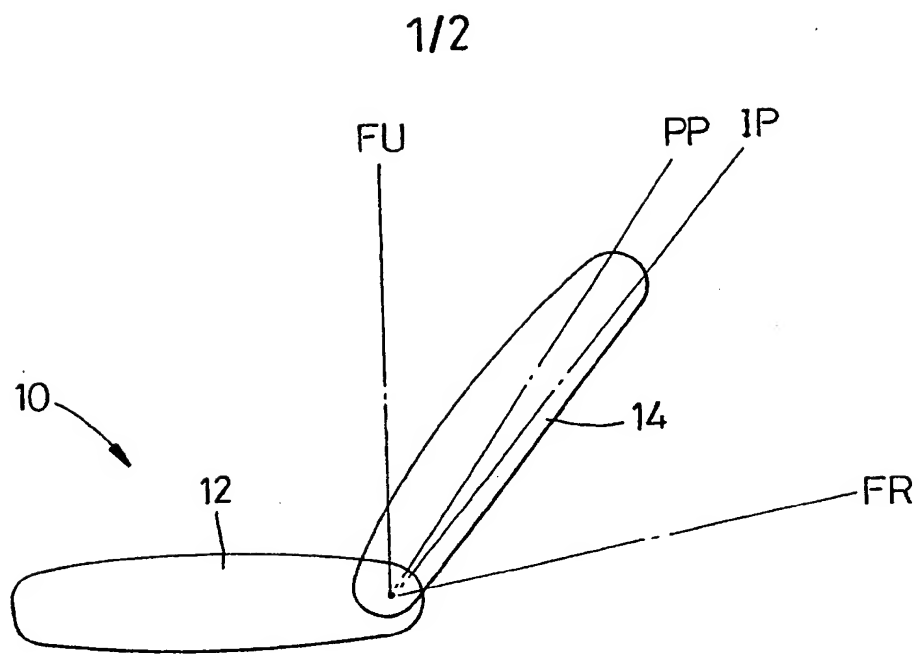


Fig. 1

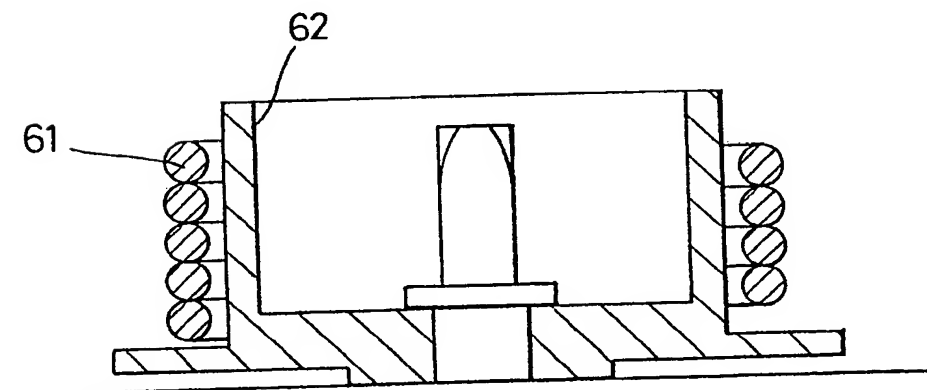
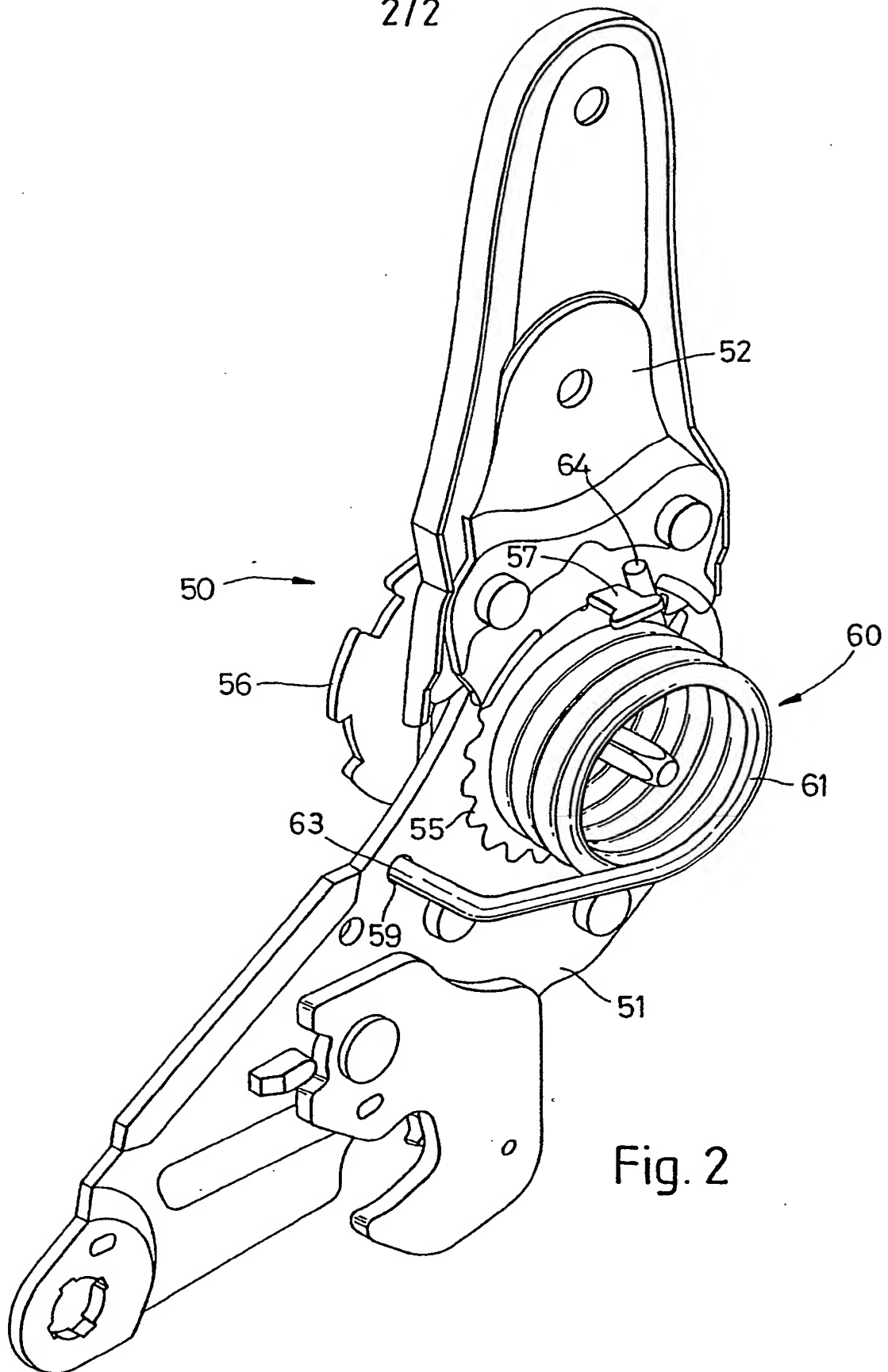


Fig. 3

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The present invention relates to a seat reclining mechanism, in particular but not exclusively, a vehicle seat reclining mechanism.

Seat reclining mechanisms of the gear driven type typically include first and second members pivotally connected to one another and a gear transmission drivingly connected to the first and second members, the gear transmission including an input shaft which on rotation causes the first and second members to be pivotally moved relative to one another.

In such seat reclining mechanism there tends to be a degree of play between the first and second members about the pivot axis due to clearances in the gear transmission. In view of this play there is a tendency for a seat back or squab to judder as it is moved in the recline direction particularly if the input shaft to the reclining mechanism is operated quickly.

It is a general aim of the present invention to eliminate or substantially reduce juddering when operating a gear driven type seat reclining mechanism.

According to one aspect of the present invention there is provided a seat reclining mechanism including first and second members pivotally connected to one another and a gear transmission drivingly connected to the first and second members, the gear transmission including an input shaft which, on rotation in one direction, causes the first and second members to move angularly apart in a reclining direction and biasing means operably connected to the first

and second members to provide a biasing force opposing movement of the first and second members in the reclining direction.

According to another aspect of the present invention  
5 there is provided a seat, preferably a vehicle seat, having a seat cushion pivotally connected to a seat back by a seat reclining mechanism including first and second members pivotally connected to one another and a gear transmission drivingly connected to the first and second members, the  
10 first member being connected to the seat cushion and the second member being connected to the seat back, the gear transmission including an input shaft which on rotation in one direction causes the first and second members to move angularly apart in a reclining direction to cause the seat  
15 back to move in said reclining direction relative to the seat squab and biasing means arranged to provide a biasing force opposing movement of the seat back in said reclining direction.

Preferably, the biasing means is arranged to  
20 progressively increase biasing force in relation to an increase in the angular displacement between the first and second members in the recline direction.

The seat back is arranged to move between a fully upright position to a fully reclined position and the  
25 biasing means is arranged to provide a biasing force which is preferably about 50 to 100%, more preferably about 75 to 90% of the gravitational biasing force created by the weight of the seat back at any position between said fully

upright and reclined positions.

Various aspects of the present invention are hereinafter described with reference to the accompanying drawings in which:-

5        Figure 1 is a diagrammatic side view of a reclining seat;

Figure 2 is a perspective view of a seat reclining mechanism according to one embodiment of the present invention;

10       Figure 3 is an axial section of part of the mechanism shown in Figure 2.

Referring initially to Figure 1 there is shown a reclining seat 10 having a seat cushion 12 pivotally connected to a seat back 14 by one or a pair of seat  
15 reclining mechanisms (not shown in Figure 1) of the gear type as previously described.

Operation of the seat reclining mechanism(s) moves the seat back 14 relative to the seat cushion 12 between a fully upright position FU and a fully reclined position FR.  
20 The seat back 14 is illustrated as being located at an intermediate position IP.

In view of tolerances within the gear transmission the seat back 14 may be freely movable between positions PP and IP ie there is free play between the seat cushion 12 and  
25 seat back 14 over the angular range between positions PP and IP. In normal use, the seat back 14 resides in position IP due to the gravitational bias created by the weight of the seat back 14.

If the seat reclining mechanism is operated to move the seat back 14 toward its fully reclined position vibration in the reclining mechanism occurs and if this vibration occurs at the natural frequency of the seat back, the seat back resonates causing it to judder.

In accordance with the present invention a biasing means is provided which provides a biasing force to oppose the movement of the seat back 14 toward the fully reclined position FP such that the vibration caused on such movement is maintained outside the natural frequency range of the seat back and therefore prevents the seat back from resonating.

The biasing means, which may be a torsion or tension spring, may be directly connected between the seat cushion 12 and seat back 14 and/or may be incorporated in the seat reclining mechanism.

Preferably the biasing force created by the biasing means progressively increases as the seat back 14 moves progressively closer to the fully reclined position FP in order to compensate for the progressive increase in gravitational bias created by the weight of the seat back. The biasing means is preferably arranged to create a biasing force which is equal to or less than the gravitational biasing force created by the weight of the seat back 14 at any position between positions FU and FR. In this way the weight of the seat back will always ensure that the seat back 14 is in position IP and not PP (or a position intermediate IP and PP). Preferably the biasing

force of the biasing means is in the range of 50 to 100%, more preferably 75 to 90% of the gravitational biasing force created by the weight of the seat back.

In Figures 2 and 3 there is shown a seat reclining mechanism 50 according to one embodiment of the present invention.

The mechanism 50 includes a first member 51 for connection to the seat cushion 12 and a second member 52 for connection to the seat back 14. The first and second members are pivotally connected by a gear transmission 55 having an input shaft (not shown) driven by a handle 56.

The reclining mechanism 50 may be of a construction similar to that disclosed in our UK patent 1586869 or European patent specification 332340.

The reclining mechanism 50 includes a biasing means 60 preferably in the form of a coiled spring 61 supported on a bobbin 62 (not shown in Figure 2) mounted on the first member 51. One end 63 of the spring is anchored to the first member 51, preferably being located in an aperture 59, and opposite end 64 abuts against an arm 57 mounted on the second member 52.

The coiled spring 61 is arranged such that angular movement between the first and second member tends to force ends 63,64 in opposite directions to uncoil the spring. This has the effect of increasing torsional resistance to such movement and so increases the biasing affect of the spring 61. Thus at position FU the spring 61 creates a minimum biasing force and at position FR creates a maximum biasing force.



CLAIMS

1. A seat reclining mechanism including first and second members pivotally connected to one another and a gear transmission drivingly connected to the first and second  
5 members, the gear transmission including an input shaft which, on rotation in one direction, causes the first and second members to move angularly apart in a reclining direction and biasing means operably connected to the first and second members to provide a biasing force opposing  
10 movement of the first and second members in the reclining direction.
2. A seat reclining mechanism according to claim 1, wherein the biasing means is arranged to progressively increase the biasing force in relation to an increase in  
15 the angular displacement between the first and second members in the recline direction.
3. A seat reclining mechanism according to claim 1 or 2, wherein the biasing means is a torsion spring.
4. A seat reclining mechanism according to claim 3,  
20 wherein the biasing means in a tension spring.
5. A seat reclining mechanism according to claim 3, wherein the torsion spring comprises a coiled spring having one end anchored to the first member and an opposite end anchored to the second member.
- 25 6. A seat having a seat cushion pivotally connected to a seat back by a seat reclining mechanism according to any preceding claim.
7. A seat having a seat cushion pivotally connected to a seat back by a seat reclining mechanism including first and  
30 second members pivotally connected to one another and a gear transmission drivingly connected to the first and second members, the first member being connected to the seat cushion and the second member being connected to the seat back, the gear transmission including an input shaft  
35 which on rotation in one direction causes the first and second members to move angularly apart in a reclining direction to cause the seat back to move in said reclining

direction relative to the seat squab and biasing means arranged to provide a biasing force opposing movement of the seat back in said reclining direction.

5 8. A seat according to claim 6 or 7, wherein the biasing means are connected between the seat cushion and seat back.

9. A seat according to claim 6,7 or 8, wherein the seat back is arranged to move between a fully upright position and a fully reclined position, the biasing means is arranged to provide a biasing force which is about 50-100%  
10 of the gravitational force created by the weight of the seat back at any position between said fully upright and fully reclined positions.

10. A seat according to claim 9, wherein the biasing means is arranged to provide a biasing force which is about 75-  
15 90% of the gravitational biasing force created by the weight of the seat back at any position between said fully upright and fully reclined positions.

**Patents Act 1977**  
**Examiner's report to the Comptroller under**  
**Section 17 (The Search Report)**

Application number

GB 9202984.4

**Relevant Technical fields**

(i) UK CI (Edition L ) E2F (FAE, FAG)

(ii) Int CI (Edition 5 ) B60N, E05D

**Search Examiner**

S J CHURCH

**Databases (see over)**

(i) UK Patent Office

(ii)

**Date of Search**

30 MARCH 1993

Documents considered relevant following a search in respect of claims 1-10

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 2162891 A (KAISHA) see balancing spring 29	1-4, 6 and 7
X	GB 2162890 A (KAISHA) see balancing spring 31	1-4, 6 and 7
X	GB 2159575 A (KAISHA) see spiral spring 28	1-4, 6 and 7
X	GB 2159574 A (KAISHA) see especially page 3 lines 67-71	1-4, 6 and 7
X	GB 1535453 (DAIMLER-BENZ) see especially page 2 lines 115-123	
X	US 4685735 (McFALLS) see spring 62	1-7

Category	Identity of document and relevant passages	Relevant to claim(s)

### Categories of documents

**X:** Document indicating lack of novelty or of inventive step.

**Y:** Document indicating lack of inventive step if combined with one or more other documents of the same category.

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**P:** Document published on or after the declared priority date but before the filing date of the present application.

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**&:** Member of the same patent family, corresponding document.

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